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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/032,180	12/21/2001	Charles X. W. Qian	514152000100	5926

20872 7590 05/17/2005

MORRISON & FOERSTER LLP
425 MARKET STREET
SAN FRANCISCO, CA 94105-2482

EXAMINER	
LEUNG, CHRISTINA Y	

ART UNIT	PAPER NUMBER
2633	

DATE MAILED: 05/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/032,180	Applicant(s) QIAN ET AL.	
	Examiner Christina Y. Leung	Art Unit 2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 21 December 2001.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-38 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-38 is/are rejected.

7)☒ Claim(s) 24,25,30 and 35 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 21 December 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 26 April 2002.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 24, 25, 30, and 35 objected to because of the following informalities:

Claims 24, 25, 30, and 35 each recite the phrase "Mach-Zhender" (sic) in the claims. Examiner respectfully notes that the spelling of this phrase should be corrected to "Mach-Zehnder." Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 5-11 and 14-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 recites "the first Gires Tournois resonator" twice, in lines 3 and 4 of the claim. There is insufficient antecedent basis for this limitations in the claim because claim 7 and claim 1 on which it depends do not recite a Gires Tournois resonator. Examiner respectfully suggests that the claim may depend on claim 3 instead.

Claims 5-10 and 14-19 each recite "the front and back mirror of" the first or second Gires-Tournois resonator in various places in the claims. There is insufficient antecedent basis for these limitations in the claims because the claims (and their respective parent claims) do not specifically recite that the first and second Gires-Tournois resonators include front or back mirrors (such mirrors are recited in claim 2; however, claims 5-10 and 14-19 do not depend on claim 2).

Also, Examiner notes that claim 16 currently recites "wherein the second phase shifter includes a first wave plate rotatably mounted between the front mirror and back mirror of the **first** Gires Tournois resonator to change the free spectral range of the second Gires Tournois resonator..." Based on Applicants' specification, Examiner respectfully suggests that the word "first" (highlighted above) in this part of the claim should be changed to "second."

Claims 11 and 20 depend on claims 9 and 19, respectively, and are also indefinite for the reason given for their parent claims.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 21 and 24 are rejected under 35 U.S.C. 102(e) as being anticipated by Jeong et al. (US 2002/0126354 A1).

Regarding claim 21, Jeong et al. disclose an optical interleaver (Figure 10) comprising:

a first interferometer which includes a first coupler 1004 and a second coupler 1010 which are interconnected by a first waveguide which defines a first light path (having length "L1" as shown in Figure 10) between the first coupler and the second coupler and which are interconnected by a second waveguide which defines a second light path (having length "L2") between the first coupler and the second coupler;

wherein the first and second light paths have different path lengths that contribute to a relative phase shift between light of a first light beam propagated along the first light path and light of a second light beam propagated along the second light path (page 7, paragraphs [0057]-[0058]);

a first ring resonator 1006 disposed adjacent to the first waveguide such that light of the first light beam is coupled between the first waveguide and the first ring resonator so as to impart a first wavelength dependent variation in phase and intensity to the first light beam which is dependent upon the optical circumference path length of the first ring resonator; and

a second ring resonator 1008 disposed adjacent to the second waveguide such that light of the second light beam is coupled between the second waveguide and the second ring resonator so as to impart a second wavelength dependent variation in phase and intensity to the second light beam which is dependent upon the optical path length of the second ring resonator (page 7, paragraph [0058]).

Regarding claim 24, Jeong et al. disclose that the first interferometer includes a Mach-Zehnder interferometer (page 7, paragraph [0057]).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeong et al. in view of Ai et al. (US 6,816,315 B1).

Regarding claim 1, Jeong et al. disclose an optical interleaver (Figure 10) comprising:

an interferometer which includes a coupler 1004, a first phase shifter and a combiner 1010;

wherein the coupler splits incident light into a first light beam and a second light beam and couples the first light beam and the second light beam to the first phase shifter;

wherein the first phase shifter includes a first light propagation element (i.e., a first waveguide) that propagates the first light beam along a first path (having length "L1" as shown in the figure) between the coupler and the combiner and that includes a second light propagation element (i.e., a second waveguide) that propagates the second light beam along a second path (having length "L2") between the coupler and the combiner, the first and second paths having different path lengths that contribute to a phase shift between light of the first light beam propagated along the first path and light of the second light beam propagated along the second path (page 7, paragraphs [0057]-[0058]);

wherein the combiner interferometrically couples the first light beam with and the second light beam;

a second phase shifter 1006 which receives first light beam light propagated along the first path between the coupler and the combiner and imparts a first wavelength dependent variation in phase to the received first light beam light; and

a third phase shifter 1008 which receives second light beam light propagated along the second path between the coupler and the combiner and imparts a second wavelength dependent variation in phase to the received second light beam light (page 7, paragraph [0058]).

Jeong et al. do not specifically disclose a phase shift tuner which adjusts a phase shift imparted to the first light beam by the second phase shifter, although they do disclose adjusting optical path length in general as necessary (page 3, paragraph [0026]).

However, Ai et al. teach a related system including a phase shifter in an optical interleaver device (column 1, lines 14-57). Ai et al. further teach including a phase shifter tuner to tune the phase shift produced by the phase shifter (column 1, lines 58-67; column 2, lines 1-2 and lines 25-50)..

It would have been obvious to a person of ordinary skill in the art to include a phase shift tuner as suggested by Ai et al. in the phase shifter in the system disclosed by Jeong et al. in order to adjust the optical path and obtain the exact phase shift desired. One in the art would have been particularly motivated to include a tuner so that the phase shifting devices may adapt to inadvertent changes to the physical characteristics of the devices due to temperature or other external conditions (Ai et al., column 1, lines 58-67; column 2, lines 1-2).

Regarding claim 4, Jeong et al. disclose that the spacing of the second phase shifter from at least one of the splitter and the combiner is different from spacing of the third phase shifter from at least one of the splitter and the combiner and such different spacing results in the different path lengths of the first path and the second path (Figure 10 shows the different path lengths L1 and L2; the spacing of the second and third phase shifters is different since the paths are of different lengths).

8. Claims 2, 3, 6, 12, 13, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeong et al. in view of Ai et al. as applied to claim 1 above, and further in view of Paiam (US 6,222,958 B1).

Regarding claims 2, 3, and 12, Jeong et al. in view of Ai et al. describe a system as discussed above with regard to claim 1. Jeong et al. disclose second and third phase shifters disposed relative to the splitter and the combiner so as to serve as the first and second light propagation elements. However, Jeong et al. disclose that the second and third phase shifters comprise ring resonators 1006 and 1008 and do not specifically disclose that the resonators in the system shown in Figure 10 with a Mach-Zehnder interferometer are Gires-Tournois resonators (although they disclose Gires-Tournois resonators in another embodiment in Figure 4; page 4, paragraphs [0038]-[0040]).

However, as Jeong et al. already show, Gires-Tournois resonators are well known in the art, and Paiam particularly teaches using a Gires-Tournois resonator instead of a ring resonator in a Mach-Zehnder interferometer path (Figure 2; column 4, lines 32-65). Paiam further teaches that a Gires-Tournois resonator includes a front mirror and a back mirror (elements 24a and 24b) spaced apart by a distance.

Further regarding claim 2 in particular, Jeong et al. disclose that the optical path lengths of the two resonators may set be equal to each other, but also disclose that distances are adjusted as necessary (page 3, paragraph [0026]). Therefore, in the system suggested by Jeong et al. in view of Paiam, Jeong et al. disclose that the optical path lengths in the resonators are different from each other (wherein the optical path length is implemented as the distance between the mirrors in the Gires-Tournois resonators taught by Paiam).

Regarding claims 2, 3, and 12, it would have been obvious to a person of ordinary skill in the art to specifically use Gires-Tournois resonators as taught by Paiam instead of the ring resonators in the system described by Jeong et al. in view of Ai et al. as an engineering design choice of a way to implement phase shifting. Paiam particularly teaches that the Gires-Tournois resonator is advantageously easier to implement than a low loss ring resonator (column 4, lines 32-39).

Further regarding claim 12 in particular, again Ai et al. teach including a phase shift tuner in a phase shifter. It would have been obvious to a person of ordinary skill in the art to further include a second phase shift tuner as taught by Ai et al. in the second phase shifter in the system described by Jeong et al. in view of Ai et al. and Paiam in order to adjust the optical path and obtain the exact phase shifts desired in both phase shifting devices. One in the art would have been particularly motivated to include tuners so that the phase shifting devices may adapt to inadvertent changes to the physical characteristics of the devices due to temperature or other external conditions (Ai et al., column 1, lines 58-67; column 2, lines 1-2).

Regarding claim 6, Jeong et al. in view of Ai et al. describe a system as discussed above with regard to claim 1 including phase shifters and a phase tuner. As similarly discussed with regard to claim 3 above, Jeong et al. disclose phase shifters comprising ring resonators 1006 and 1008 and do not specifically disclose that the resonators in the system shown in Figure 10 with a Mach-Zehnder interferometer are Gires-Tournois resonators (although they disclose Gires-Tournois resonators in another embodiment in Figure 4; page 4, paragraphs [0038]-[0040]).

However, again, Paiam particularly teaches using a Gires-Tournois resonator instead of a ring resonator in a Mach-Zehnder interferometer path (Figure 2; column 4, lines 32-65). Paiam

further teaches that a Gires-Tournois resonator includes a front mirror and a back mirror (elements 24a and 24b) spaced apart by a distance.

Regarding claim 6, it would have been obvious to a person of ordinary skill in the art to specifically use a Gires-Tournois resonator as taught by Paiam instead of the ring resonator in the system described by Jeong et al. in view of Ai et al. as an engineering design choice of a way to implement phase shifting. Paiam particularly teaches that the Gires-Tournois resonator is advantageously easier to implement than a low loss ring resonator (column 4, lines 32-39).

Regarding claim 15, Jeong et al. in view of Ai et al. and Paiam describe a system as discussed above with regard to claim 12, including phase tuners and Gires-Tournois resonators.

Further regarding claims 6 and 15, Jeong et al. do not specifically disclose a wave plate rotatably mounted between the mirrors of a Gires-Tournois resonator, but Ai et al. further suggest tuning a Gires-Tournois resonator with at least one wave plate 30 rotatably mounted between the front and back mirrors (elements 12 and 14) of the resonator (Figure 8; (column 1, lines 32-57, column 2, lines 25-50; column 5, lines 19-46).

Regarding claims 6 and 15, it would have been obvious to a person of ordinary skill in the art to include at least one wave plate as taught by Ai et al. in the system describe by Jeong et al. in view of Ai et al. and Paiam as a way to implement the phase shifter with advantageous tuning capabilities. Again, one in the art would have been particularly motivated to include tuners as taught by Ai et al. so that the phase shifting devices may adapt to inadvertent changes to the physical characteristics of the devices due to temperature or other external conditions (Ai et al., column 1, lines 58-67; column 2, lines 1-2).

Regarding claim 13, Jeong et al. disclose that the spacing of the second phase shifter from at least one of the splitter and the combiner is different from spacing of the third phase shifter from at least one of the splitter and the combiner and such different spacing results in the different path lengths of the first path and the second path (Figure 10 shows the different path lengths L1 and L2; the spacing of the second and third phase shifters is different since the paths are of different lengths).

9. Claims 5 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeong et al. in view of Ai et al., Paiam, and Rosenfeldt (US 2003/0053174 A1).

Regarding claim 5, Jeong et al. in view of Ai et al. describe a system as discussed above with regard to claim 1 including phase shifters and a phase tuner. As similarly discussed with regard to claim 3 above, Jeong et al. disclose phase shifters comprising ring resonators 1006 and 1008 and do not specifically disclose that the resonators in the system shown in Figure 10 with a Mach-Zehnder interferometer are Gires-Tournois resonators (although they disclose Gires-Tournois resonators in another embodiment in Figure 4; page 4, paragraphs [0038]-[0040]).

However, again, Paiam particularly teaches using a Gires-Tournois resonator instead of a ring resonator in a Mach-Zehnder interferometer path (Figure 2; column 4, lines 32-65). Paiam further teaches that a Gires-Tournois resonator includes a front mirror and a back mirror (elements 24a and 24b) spaced apart by a distance.

Regarding claim 5, it would have been obvious to a person of ordinary skill in the art to specifically use a Gires-Tournois resonator as taught by Paiam instead of the ring resonator in the system described by Jeong et al. in view of Ai et al. as an engineering design choice of a way

to implement phase shifting. Paiam particularly teaches that the Gires-Tournois resonator is advantageously easier to implement than a low loss ring resonator (column 4, lines 32-39).

Regarding claim 14, Jeong et al. in view of Ai et al. and Paiam describe a system as discussed above with regard to claim 12, including phase tuners and Gires-Tournois resonators.

Regarding claims 5 and 14, neither Jeong et al., Ai et al., nor Paiam specifically suggest that the Gires-Tournois resonator includes a piezo-electric spacer.

However, Rosenfeldt teaches a related phase shifter including a Gires-Tournois resonator and further teaches including a piezo-electric spacer between the front and back mirrors of the resonator to tune the phase shift of the device (page 3, paragraphs [0044]-[0046]).

Regarding claims 5 and 14, it would have been obvious to a person of ordinary skill in the art to implement the phase shifter and tuner in the system described by Jeong et al. in view of Ai et al. and Paiam, with a piezo-electric spacer as an engineering design choice of another way to implement the phase shifter with advantageous tuning capabilities. The claimed differences exist not as a result of an attempt by Applicants to solve an unknown problem but merely amount to the selection of expedients known as design choices to one of ordinary skill in the art.

10. Claims 9-11 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeong et al. in view of Ai et al., Paiam, and Yeh et al. (US 2003/0035223 A1).

Regarding claims 9-11, Jeong et al. in view of Ai et al. describe a system as discussed above with regard to claim 1 including phase shifters and a phase tuner. As similarly discussed with regard to claim 3 above, Jeong et al. disclose second and third phase shifters comprising ring resonators 1006 and 1008 and do not specifically disclose that the resonators in the system shown in Figure 10 with a Mach-Zehnder interferometer are Gires-Tournois resonators (although

they disclose Gires-Tournois resonators in another embodiment in Figure 4; page 4, paragraphs [0038]-[0040]).

However, again, Paiam particularly teaches using a Gires-Tournois resonator instead of a ring resonator in a Mach-Zehnder interferometer path (Figure 2; column 4, lines 32-65). Paiam further teaches that a Gires-Tournois resonator includes a front mirror and a back mirror (elements 24a and 24b) spaced apart by a distance.

Regarding claims 9-11, it would have been obvious to a person of ordinary skill in the art to specifically use Gires-Tournois resonators as taught by Paiam instead of the ring resonators in the system described by Jeong et al. in view of Ai et al. as an engineering design choice of a way to implement phase shifting. Paiam particularly teaches that the Gires-Tournois resonator is advantageously easier to implement than a low loss ring resonator (column 4, lines 32-39).

Regarding claims 18-20, Jeong et al. in view of Ai et al. and Paiam describe a system as discussed above with regard to claim 12, including phase tuners and Gires-Tournois resonators.

Further regarding claims 9-11 and 18-20, neither Jeong et al., Ai et al., nor Paiam specifically suggest that the Gires-Tournois resonators include a cavity filled with fluid optical medium which determines an index of refraction.

However, Yeh et al. teach a related phase shifter including a Gires-Tournois resonator (page 1, paragraph [0005]). They further teach that the Gires-Tournois resonator comprises a cavity defined by the front and back mirrors of the resonator filled with a gas (such as argon; page 2, paragraph [0020]) which determines an index of refraction with the cavity. They further teach tuning the phase shift of the device by changing the gas in the cavity (pages 1 and 2, paragraphs [0018]-[0020]).

Regarding claims 9-11 and 18-20, it would have been obvious to a person of ordinary skill in the art to implement the phase shifters and tuners in the system described by Jeong et al. in view of Ai et al. and Paiam, with gas-filled cavities as suggested by Yeh et al. as an engineering design choice of another way to implement the phase shifters with advantageous tuning capabilities. The claimed differences exist not as a result of an attempt by Applicants to solve an unknown problem but merely amount to the selection of expedients known as design choices to one of ordinary skill in the art.

11. Claims 7, 8, 16, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeong et al. in view of Ai et al., Paiam, and Gu (US 6,606,182 B2).

Regarding claims 7 and 8, Jeong et al. in view of Ai et al. describe a system as discussed above with regard to claim 1 including phase shifters and a phase tuner. As similarly discussed with regard to claim 3 above, Jeong et al. disclose phase shifters comprising ring resonators 1006 and 1008 and do not specifically disclose that the resonators in the system shown in Figure 10 with a Mach-Zehnder interferometer are Gires-Tournois resonators (although they disclose Gires-Tournois resonators in another embodiment in Figure 4; page 4, paragraphs [0038]-[0040]).

However, again, Paiam particularly teaches using a Gires-Tournois resonator instead of a ring resonator in a Mach-Zehnder interferometer path (Figure 2; column 4, lines 32-65). Paiam further teaches that a Gires-Tournois resonator includes a front mirror and a back mirror (elements 24a and 24b) spaced apart by a distance.

Regarding claims 7 and 8, it would have been obvious to a person of ordinary skill in the art to specifically use Gires-Tournois resonators as taught by Paiam instead of the ring resonators

in the system described by Jeong et al. in view of Ai et al. as an engineering design choice of a way to implement phase shifting. Paiam particularly teaches that the Gires-Tournois resonator is advantageously easier to implement than a low loss ring resonator (column 4, lines 32-39).

Regarding claims 16 and 17, Jeong et al. in view of Ai et al. and Paiam describe a system as discussed above with regard to claim 12, including phase tuners and Gires-Tournois resonators.

Further regarding claims 7-8 and 16-17, Jeong et al. do not specifically disclose a wave plate rotatably mounted between the mirrors of a Gires-Tournois resonator, but Ai et al. further suggest tuning a Gires-Tournois resonator with at least one wave plate 30 rotatably mounted between the front and back mirrors (elements 12 and 14) of the resonator (Figure 8; (column 1, lines 32-57, column 2, lines 25-50; column 5, lines 19-46).

Regarding claims 7-8 and 16-17, it would have been obvious to a person of ordinary skill in the art to include at least one wave plate as taught by Ai et al. in the system describe by Jeong et al. in view of Ai et al. and Paiam as a way to implement the phase shifter with advantageous tuning capabilities. Again, one in the art would have been particularly motivated to include tuners as taught by Ai et al. so that the phase shifting devices may adapt to inadvertent changes to the physical characteristics of the devices due to temperature or other external conditions (Ai et al., column 1, lines 58-67; column 2, lines 1-2).

Further regarding claims 7-8 and 16-17, neither Jeong et al., Ai et al., nor Paiam suggest another wave plate in each phase shifter to change the free spectral range of the resonator. However, Gu further teaches another Gires-Tournois resonator including a wave plate rotably mounted and used to adjust the free spectral range of the resonator (column 1, lines 38-49;

column 3, lines 5-10). It would have been obvious to a person of ordinary skill in the art to further include another wave plate for changing the free spectral range as taught by Gu in the system described by Jeong et al. in view of Ai et al. and Paiam in order to finely adjust the response of the device to desired exact wavelengths.

12. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jeong et al.

Regarding claim 35, Jeong et al. disclose an optical interleaver (Figure 10) comprising:

a Mach-Zehnder interferometer which includes a first coupler 1004 and a second coupler 1010 and a first waveguide light path between the first and second couplers and a second waveguide light path between the first and second couplers;

wherein the first and second light paths have different path lengths that contribute to a phase shift between first light propagated along the first path and second light propagated along the second path (page 7, paragraphs [0057]-[0058]);

a second phase shifter 1006 optically coupled to receive first light beam light propagated along the first path between the first coupler and the second coupler and which imparts a wavelength dependent variation in phase and intensity to the received first light beam light; and

a third phase shifter 1008 optically coupled to receive second light beam light propagated along the second path between the first coupler and the second coupler and which imparts a wavelength dependent variation in phase and intensity to the received second light beam light (page 7, paragraph [0058]).

Jeong et al. do not specifically disclose that the second and third phase shifters are also Mach-Zehnder interferometers, but phase shifters comprising Mach-Zehnder interferometers are well known in the art, as Jeong et al. themselves teach with regard to their first phase shifter. It

would have been obvious to a person of ordinary skill in the art to use Mach Zehnder interferometers as the second and third phase shifters in the system disclosed by Jeong et al. as an engineering design choice of a way to implement the two additional phase shifters already disclosed. The claimed differences exist not as a result of an attempt by Applicants to solve an unknown problem but merely amount to the selection of expedients known as design choices to one of ordinary skill in the art. Examiner respectfully notes that Applicants other claims also recite various other types of phase shifters as the second and third phase shifters of their invention.

13. Claims 22, 23, 25-34, 36 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeong et al. in view of Paiam.

Regarding claims 22 and 23, Jeong et al. disclose an optical interleaver as discussed above with regard to claim 21, including first and second couplers. They disclose that the couplers are selected from a variety of coupler elements known in the art (page 7, paragraph [0057]) but do not specifically disclose 3-dB couplers. However, Paiam teach a system related to the one disclosed by Jeong et al., including a Mach-Zehnder interferometer, and Paiam further teach using 3-dB couplers to connect the paths of the interferometer (column 4, lines 40-65).

It would have been obvious to a person of ordinary skill in the art to use 3-dB couplers as taught by Paiam as the couplers of the system disclosed by Jeong et al. as an engineering design choice of a well known and widely available coupler element. The claimed differences exist not as a result of an attempt by Applicants to solve an unknown problem but merely amount to the selection of expedients known as design choices to one of ordinary skill in the art.

Regarding claims 25 and 30, Jeong et al. disclose an optical interleaver comprising:

a Mach-Zhender interferometer which includes a first fiber coupler 1004 and a second fiber coupler 1010 which are interconnected by a first light path between the first coupler and the second coupler and which are interconnected by a second light path between the first coupler and the second coupler wherein the first light path includes a first fiber path optically coupled to a first resonator 1006 and wherein the second light path includes a second fiber path optically coupled to a second resonator 1008 and wherein the first and second light paths have different path lengths that contribute to a relative phase shift between light of a first light beam propagated along the first light path and light of a second light beam propagated along the second light path (page 7, paragraphs [0057]-[0058]).

Jeong et al. disclose ring resonators 1006 and 1008 and do not specifically disclose that the resonators in the system shown in Figure 10 with a Mach-Zehnder interferometer are Gires-Tournois resonators (although they disclose Gires-Tournois resonators in another embodiment in Figure 4; page 4, paragraphs [0038]-[0040]).

However, as Jeong et al. already show, Gires-Tournois resonators are well known in the art, and Paiam particularly teaches using a Gires-Tournois resonator instead of a ring resonator in a Mach-Zehnder interferometer path (Figure 2; column 4, lines 32-65). Paiam further teaches that a Gires-Tournois resonator includes a front mirror and a back mirror (elements 24a and 24b) spaced apart by a distance.

Jeong et al. disclose that the optical path lengths of the two resonators may set be equal to each other, but also disclose that distances are adjusted as necessary (page 3, paragraph [0026]). Therefore, in the system suggested by Jeong et al. in view of Paiam, Jeong et al. disclose that the optical path lengths in the first and second resonators are different from each other (wherein the

optical path length is implemented as the distance between the mirrors in the Gires-Tournois resonators taught by Paiam).

Regarding claims 26, 27, 31, and 32 in particular, Paiam further teach including collimating lens (beam collimator 52, shown in Figure 5) between a waveguide and a Gires-Tournois resonator in order to couple the light from the waveguide to the resonator..

Regarding claims 25 and 30, it would have been obvious to a person of ordinary skill in the art to specifically use Gires-Tournois resonators with collimating lenses as taught by Paiam instead of the ring resonators in the system disclosed by Jeong et al. as an engineering design choice of a way to implement phase shifting. Paiam particularly teaches that the Gires-Tournois resonator is advantageously easier to implement than a low loss ring resonator (column 4, lines 32-39).

Regarding claims 28, 29, 33, and 34, as similarly discussed above with regard to claims 22 and 23, Jeong et al. disclose first and second couplers selected from a variety of coupler elements known in the art (page 7, paragraph [0057]) but do not specifically disclose 3-dB couplers. However, Paiam teach a system related to the one disclosed by Jeong et al., including a Mach-Zehnder interferometer, and Paiam further teach using 3-dB couplers to connect the paths of the interferometer (column 4, lines 40-65). It would have been obvious to a person of ordinary skill in the art to use 3-dB couplers as taught by Paiam as the couplers of the system disclosed by Jeong et al. as an engineering design choice of a well known and widely available coupler element. The claimed differences exist not as a result of an attempt by Applicants to solve an unknown problem but merely amount to the selection of expedients known as design choices to one of ordinary skill in the art.

Regarding claims 36 and 37, Jeong et al. suggest an optical interleaver as discussed above with regard to claim 35, including first and second couplers. They disclose that the couplers are selected from a variety of coupler elements known in the art (page 7, paragraph [0057]) but do not specifically disclose 3-dB couplers. However, Paiam teach a system related to the one disclosed by Jeong et al., including a Mach-Zehnder interferometer, and Paiam further teach using 3-dB couplers to connect the paths of the interferometer (column 4, lines 40-65).

It would have been obvious to a person of ordinary skill in the art to use 3-dB couplers as taught by Paiam as the couplers of the system suggested by Jeong et al. as an engineering design choice of a well known and widely available coupler element. The claimed differences exist not as a result of an attempt by Applicants to solve an unknown problem but merely amount to the selection of expedients known as design choices to one of ordinary skill in the art.

14. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jeong et al. in view of Al-hemyari (US 6,510,259 A).

Regarding claim 38, Jeong et al. disclose an optical interleaver (Figure 10) comprising:

an interferometer which includes a coupler 1004, a first phase shifter and a combiner 1010;

wherein the coupler splits incident light into a first light beam and a second light beam and couples the first light beam and the second light beam to the first phase shifter;

wherein the first phase shifter includes a first light propagation element (i.e., a first waveguide) that propagates the first light beam along a first path (having length "L1" as shown in the figure) between the coupler and the combiner and that includes a second light propagation element (i.e., a second waveguide) that propagates the second light beam along a second path

(having length "L2") between the coupler and the combiner, the first and second paths having different path lengths that contribute to a phase shift between light of the first light beam propagated along the first path and light of the second light beam propagated along the second path (page 7, paragraphs [0057]-[0058]);

wherein the combiner interferometrically couples the first light beam with and the second light beam;

a second phase shifter 1006 which receives first light beam light propagated along the first path between the coupler and the combiner and imparts a first wavelength dependent variation in phase to the received first light beam light;

a third phase shifter 1008 which receives second light beam light propagated along the second path between the coupler and the combiner and imparts a second wavelength dependent variation in phase to the received second light beam light (page 7, paragraph [0058]).

Jeong et al. do not specifically disclose a phase shift tuner which adjusts a phase shift imparted by a difference in path lengths between the first and second light paths. However, Al-hemyari teaches a phase shifter related to the first phase shifter disclosed by Jeong et al. including a Mach-Zehnder interferometer and further teaches providing a phase shift tuner which adjusts a phase shift imparted by a difference in path lengths between the first and second light paths in the Mach-Zehnder interferometer (column 3, lines 19-45). It would have been obvious to a person of ordinary skill in the art to include a phase shift tuner as taught by Al-hemyari for adjusting a phase shift imparted by a difference in path lengths between the first and second light paths in the system disclosed by Jeong et al. obtain the exact phase shift desired. One in the art

would have been particularly motivated to include a tuner so that the phase shifter may adapt to inadvertent changes to the physical characteristics of the device due to temperature or other external conditions.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christina Y. Leung whose telephone number is 571-272-3023. The examiner can normally be reached on Monday to Friday, 6:30 to 3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2600.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Christina Y Leung
Christina Y Leung
Patent Examiner
Art Unit 2633